NOTES ON SOME OPISTHOBRANCHS MAINLY FROM SOUTH AUSTRALIA

By ROBERT BURN*

SUMMARY

Of a collection of ten opisthobranch species (Mollusca: Gastropoda) from South Australia, three are described as new: *Haminoea maugeansis* (Atyidae), *Neodoris subaustralis* and *Aphelodoris lawsae* (Doridiidae), and one is a new record for the State: *Chromodoris lasmaniensis* Bergh, 1905 (Doridiidae). A study of the genus *Aphelodoris* Bergh, 1879, in south-eastern Australia indicates six distinct species, of which two are named, *berghi* Odhner, 1924, and *varia* (Abraham, 1877), and four are described as new: *lawsae*, *rossquicki*, *juliae* and *greeni*. According to the literature, *Aphelodoris* in Australia differs from other species of the genus in that the insemination duct between the female gland mass and the spermatheca is divided into a true *small* uterine duct and a wide terminally dilated *large* uterine duct. The spermatocyst is attached to the terminal dilation of the large uterine duct.

INTRODUCTION

Seven species of opisthobranch molluscs from the collections of the South Australian Museum were forwarded to the writer for identification by Dr. Helene Laws. Descriptions of these and three other species, all from South Australia, are presented in this research. Five species of the genus *Aphelodoris* Bergh, 1879, from New South Wales, Victoria and Tasmania are included.

This research was completed while the writer was in receipt of a grant from the Science and Industry Endowment Fund, C.S.I.R.O. The survey of the genus *Aphelodoris* is part of a comprehensive study of the Opisthobranchia of Australia being undertaken by the writer. Due acknowledgment is made also to Dr. Helene Laws, South Australian Museum, Adelaide (S.A.M.), Mrs. J. Hope Black (née Macpherson), National Museum of Victoria, Melbourne (N.M.V.), Dr. D. F. McMichael, Australian Museum, Sydney (A.M.), Mr. R. H. Green, Queen Victoria Museum, Launceston (Q.V.M.), and Mrs. Julia Greenhill, Tasmania Museum, Hobart (T.M.), for the loan of material considered in this research.

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SYSTEMATIC SECTION

Order CEPHALASPIDEA

Suborder SCAPHANDRACEA

Family ATYIDAE

Haminoea maugeansis sp. nov.

Fig. 1-2

Haminoea tenera. Pritchard and Gatliff, 1903: 217, non *H. tenera* (A. Adams, 1850: 583; Pilsbry, 1993: 371; Angas, 1871: 98).
Haminoea tenera. May, 1921: 104; 1923: pl. 46, fig. 17.
Haminoea tenera. Cotton and Godfrey, 1933: 86.
Haminoea tenera. Macpherson and Gabriel, 1962: 243, fig. 283.

Material examined. SOUTH AUSTRALIA: Port MacDonnell, 1962, 3 specimens, G. Causer, N.M.V. reg. no. F26,134 (Holotype), F25,658 (dissected Paratype), S.A.M. reg. no. D.14868 (whole Paratype). VICTORIA: Rhyll, Flinders, Shoreham, Pt. Lonsdale, Torquay, numerous examples in the writers' collection.

Habitat. Crawling and browsing on *Zostera* and *Posidonia*, and on short brown algae on rock platforms.

Description. The shells of the type series are each 7 mm long and 5 mm broad. The shell (fig. 1) is delicate, broadly ovate but somewhat contracted above and rounded below. Apex very slightly impressed; outer lip rising above the apex, slightly rounded in the middle and narrowly rounded at the bottom of the aperture. Columella short, its edge reflected and continued over the inner lip as a thin glaze. The shell is entirely smooth except for minute growth lines parallel to the border of the shell. Dry shells are translucent yellow green.

The crawling animal is about twice the length of its shell. Live colouration is pale dull yellow body, everywhere suffused with dark grey pigment. Racemose orange pigment cells are prominent on the head and inside the shell. Preserved specimens soon lose all sign of the orange cells.

The head shield is broad anteriorly and slightly rounded, narrower and bilobate behind. Small black eyes show at the anterior third of the head. The parapodia are small and nearly meet in the middle line. Sole elongate oval, minutely notched in the front edge, with a small pyriform pedal gland in the rear middle line, sole length about two-thirds total animal length. Behind, in the sole plane, projects the tail-like epicochlear expansion. The shell mantle projects from the small end of the aperture and lies at the left posterior of the shell. In the groove on each side of the head is a narrow fleshy ridge; these are the organs of Hancock.

The brownish jaws consist of fine rods set end on, the projecting ends rounded. Radula (fig. 2) colourless, formula 24 x 6.1.6. The rhachidian has a broad base, a rather small cusp and a pair of insignificant lateral denticles. Lateral teeth 1-5 are high with large cusps, the marginal is shorter and blunt. The three brownish gastral plates each have 14 transverse ribs.

The anatomy was not investigated further.

Discussion. Angas (1871: 98) first introduced the name *H. tenera* (A. Adams, 1850: 583) into the Australian fauna when he recorded a species from the central New South Wales coastline. Whether or not the New South Wales species is correctly named does not concern us here. It is however specifically distinct from the species described above. The name *H. tenera* has been taken up in South Australia, Tasmania and Victoria for a shell of rounder shape that is smoother, more fragile and without periostracum. Consequently, the southern species is described as new.

H. maugeansis is recorded authentically from Tasmania (May, 1923), Victoria and South Australia. Its range into south Western Australia (Cotton, 1959: 404) needs to be verified.

Provisionally at least, the new species can be assigned to the section *Haloa* Pilsbry (1920: 367) which is characterized by "columella deeply concave, the reflected columellar margin crescentic, rather thick, its edge separated from the whorl by a furrow". Under more recent classifications, it belongs to the genus *Lamprohaminoea* Kuroda and Habe (1952: Habe, 1952: 150) with a smooth polished shell, green animal with many red markings, and the first lateral tooth with one cusp. Zilch (1959: 43) includes *Lamprohaminoea* and *Haloa* as subgenera in his treatment of *Haminoea*. The new species is retained in *Haminoea* until the species of this group are better known anatomically.

The specific name *maugeansis* refers to the distribution of the species throughout the Maugean cool-temperate province (Tasmania) and the adjacent Victorian and South Australian mainland coasts (Bennett and Pope, 1953).

Suborder PHILINACEA
Family PHILINIDAE

Philine angasi (Crosse and Fischer)

Bullaea angasi Crosse and Fischer, 1865: 38, pl. 2, fig. 8.
Philine angasi. Cotton and Godfrey, 1933: 88, pl. 1, fig. 16.

Material examined. SOUTH AUSTRALIA: Peak Bay, Spencer Gulf, 16 February 1956, 1 specimen, Mrs. J. Hope Black, N.M.V. reg. no. F17,475.

Habitat. Burrowing just below the surface of sandy mud.

Distribution. Southern Australia, from south Western Australia to southern Queensland, littoral to 25 fathoms.

Discussion. The type locality of *P. angasi* is Spencer Gulf, South Australia. The present specimen, though topotypical, is too contracted and distorted to be examined anatomically. The radula has been figured from Victorian specimens (Maplestone, 1872: pl. 27, fig. 23) and the gastral plates from New South Wales specimens (Hedley, 1912: pl. 44, fig. 42-43).

Order NUDIBRANCHIA
Suborder DORIDACEA
Division EUDORIDACEA
Subdivision CRYPTOBRANCHIA
Family DORIDIDAE
Subfamily CHROMODORIDINAE

Hypselodoris saintvincentius Burn

Hypselodoris saintvincentius Burn, 1962B: 151, pl. 1, fig. 1-2.

Material examined. SOUTH AUSTRALIA: Reef, Christies Beach, near Adelaide, Gulf St. Vincent, 2 May 1963, 1 specimen, Dr. Helene Laws, S.A.M. reg. no. D.14869.

Habitat. Under stones at low tide.

Discussion. This is the first record of the species from the eastern side of Gulf St. Vincent. The type locality is Coobowie on the western shore.

Chromodoris tasmaniensis Bergh

Fig. 3

Chromodoris tasmaniensis Bergh, 1905: 69, pl. 5, fig. 12-15.
Glossodoris tasmaniensis. Burn, 1957: 17, pl. 2, fig. 10.
Glossodoris tasmaniensis. Burn, 1961: 56, pl. 15, fig. 4.

Material examined. SOUTH AUSTRALIA: Port MacDonnell, January 1965, 2 specimens, Mrs. and the late Mr. Ross Quick, S.A.M. reg. no. D.14870.

Habitat. Beneath stones at low tide.

Description. The two living slugs were "white with orange spots around the margins". Preserved they are purple-grey and 18 mm long.

The labial armature of the more contracted slug is brownish and composed of minute straight simple elements set end on in a wide band. The colourless radula has the formula 45 x 34.0.34. The first lateral tooth is broad and set a little way apart from the others in the half row as in Victorian slugs (Burn, 1961: 56); it has two

denticles on the inner side and three on the outer side. The other laterals are hamate with three to five denticles. The marginals are smaller.

In the genital organs (fig. 3), the ampulla (am) is rather long, the inner prostatic male duct (pr) is very long, winding and thin walled, the vas deferens is short, slender and muscular, and the penis (pe), in both specimens, sabot-shaped with a wide seminal aperture. The spermatheca (sp) is ovoid, the spermatocyst (sc) slender pyriform.

Discussion. The two slugs are identical with specimens from Victoria (Burn, 1957, 1961) in colour and radular formula and shape. They differ from the Ulverstone, Tasmania type specimen in the smaller number of branchiae, the shape of the labial elements and the radular formula. However, until Tasmanian slugs can be reliably identified with Bergh's description, it is better to conserve the name *C. tasmaniensis* for the present species and not rename it. The outstanding characteristic of the South Australian and Victorian slugs is that the first lateral tooth of the radula is set apart from the other teeth in the half row.

C. tasmaniensis is a new record for South Australia. It apparently has a wide range along the western Victorian coastline.

Subfamily MIAMIRINAE

Ceratosoma brevicaudatum Abraham

Ceratosoma brevicaudatum Abraham, 1876: 142, pl. 8, fig. 6.
Ceratosoma brevicaudatum. Basedow and Hedley, 1905: 154, pl. 1.
Ceratosoma brevicaudatum. Cotton and Godfrey, 1933: 105, pl. 3, fig. 4.
Ceratosoma brevicaudatum. Burn, 1962B: 153.

Material examined. SOUTH AUSTRALIA: Whyalla, October 1964, 1 specimen, S.A.M. reg. no. D.14871; Pelican Lagoon, Kangaroo Island, 23 April 1953, 1 specimen, S.A.M. reg. no. D.14874; unlocalized, 2 specimens, S.A.M. reg. no. D.14877; Sir Joseph Banks Group, Spencer Gulf, 13 June 1965, 1 specimen, R. Bentley, S.A.M. reg. no. D.14881.

Habitat. Under stones and crawling in rock pools at low tide, dredged to 20 fathoms (Basedow and Hedley, 1905).

Discussion. Two synonyms of this species are *C. oblongum* Abraham (1876: 143, pl. 7, fig. 7) and *C. adelaidae* Basedow and Hedley (1905: 156, pl. 10, fig. 3-4). The former is based upon a spirit distorted specimen (O'Donoghue, 1924: 558) and the latter describes very small juvenile specimens (Burn, 1957: 18).

Subfamily Discodoridinae

Neodoris subaustralis sp. nov.

Fig. 4-6

Material examined. SOUTH AUSTRALIA: Sir Joseph Banks Group, Spencer Gulf, 13 June 1965, 1 specimen (Holotype), R. Bentley, S.A.M. reg. no. D.14876.

Habitat. Dredged (? in shallow water).

Description. The strongly curled holotype is 14 mm long and 12 mm broad; the length along the curve of the notum is about 30 mm. The preserved colour (after five months in 70% alcohol) is entirely cream with the exception of the retracted branchiae which are grey-brown.

The body (fig. 4) is convex in section, rounded in front and behind. The notum is a little wider than the foot and thick edged. The rhinophores and branchiae have no sheaths or pustular ornament around their cavities. The entire notum is covered by low pustules disposed in four longitudinal series of larger pustules, each surrounded by five or six smaller pustules, in the median area, and a wide band of very small and crowded pustules encircles the notum. Foot rounded and bilaminate anteriorly, obtusely pointed behind and extending a little way posteriorly beyond the notum. Mouth not prominent, oral tentacles an oblique grooved fold on each side.

The thickened labial cuticle is entirely smooth. The pale yellow radula (fig. 5) has the formula 38 x 40-41.0.40-41. The inner teeth are small and erect with straight cusps. The teeth gradually increase in height and cusp length to about teeth 35-37. The outer 4-5 teeth are much smaller with reduced cusps. The large ear-like expansion on the inner side of the larger teeth is very distinctive.

The anterior genital mass (fig. 6) has a small winding ampula (am) lying behind the large knotty prostate gland (pr). The vas deferens (vd) is short and straight, the unarmed penial sheath (ps)

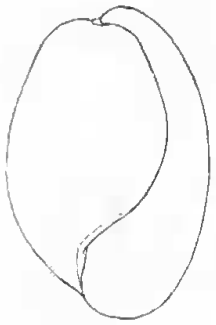
EXPLANATION OF FIGURES

Fig. 1-2. *Haminaea maugeansis* sp. nov.
1. Ventral aspect of shell of dissected Paratype.
2. Half row of radula.

Fig. 3. *Chromodoris tasmaniensis* Bergh.
3. Anterior genital mass.

Fig. 4-6. *Neodoris subaustralis* sp. nov.
4. Dorsal view of flattened Holotype.
5. Half row of radula.
6. Anterior genital mass.

Fig. 7-9. *Aphelodoris lawsae* sp. nov.
7. Dorsal view of slug from Sir Joseph Banks Group.
8. Half row of radula.



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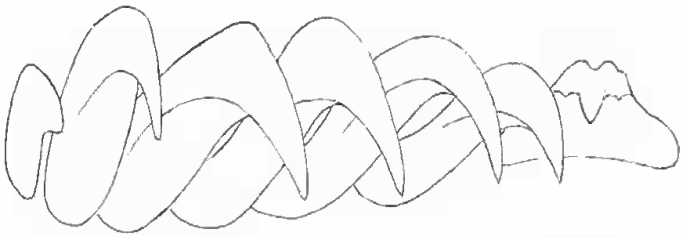

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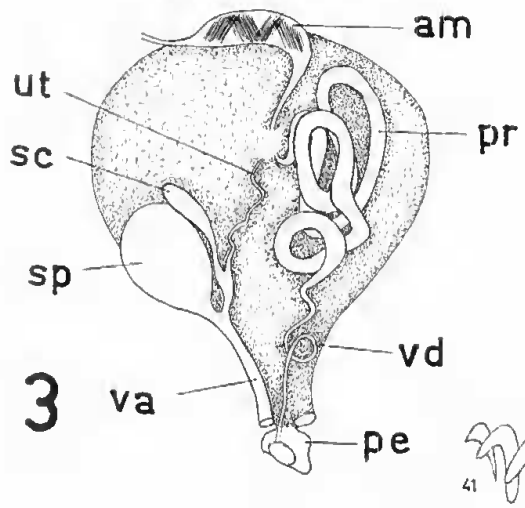

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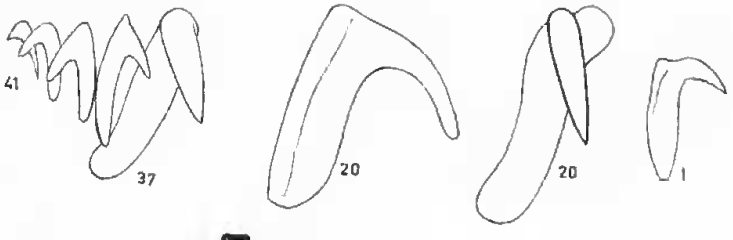

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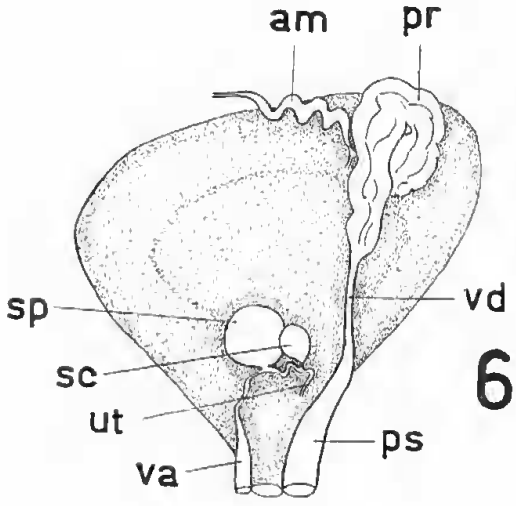

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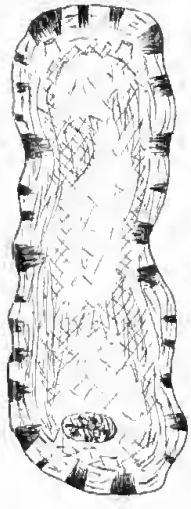

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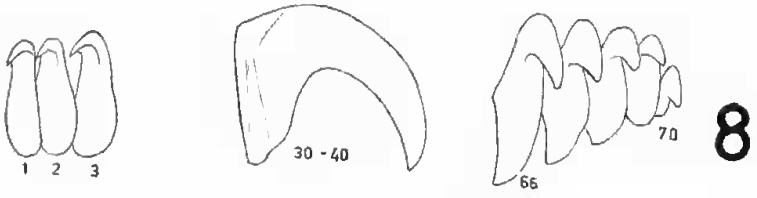

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Figs. 1, 2, 3, 4, 5, 6, 7, 8.

widens towards the atrium. The vagina (va) is wide at its aperture beside the penial sheath, slender thereafter. The circular spermatheca (sp) is white and attached directly to the vagina. The red-pink spermatocyst (sc) is smaller and connected by a short duct to the uterine duct (ut). The mucus gland is brick-red and encased in the yellowish albumen gland.

Discussion. N. subaustralis closely resembles *N. chrysoderma* (Angas, 1864: 46; Burn, 1957: 19, *Praegliscila*) from New South Wales and Victoria. But *N. chrysoderma* has fewer more widely spaced pustules upon the notum, 78 slender hamate teeth in the radular half row, a thinner labial cuticle and an elongate winding prostate gland.

From the literature, *N. subaustralis* is as notally pustulose as *N. tricolor* Baba (1938; 1949: 150), *N. crinacea* Marcus (1959: 38) and *N. carri* Marcus (1959: 39). All three species have far more teeth (respectively 60-80, 75, 60-62) per radular half row than the new species with 40-41 teeth.

Subfamily HALGERDINAE

Genus **Aphelodoris** Bergh (1879: 107)

Six species* of *Aphelodoris* occur in south-eastern Australia including one species in South Australia. Four of the species are described below as new and the other two species are redescribed from fresh material.

Species of *Aphelodoris* are characterized by their "glossodoridiform" or high, slender, elongate body shape with usually narrow notal brim, smooth notum, high conical rhinophoral and branchial sheaths, laterally grooved oral tentacles, five-branched branchiae, smooth labium, hook-shaped radular teeth without denticles, unarmed penial sheath, large prostatic part in male duct, and spermatheca and spermatocyst arranged "serially" (Odhner, 1934: 270) or semiserially.

Marcus (1963: 33) found the innermost lateral tooth of the radular half row to be simply hooked in the type species, *A. antillensis* Bergh (1879: 108). Bergh, however, reported it to bear an inner denticle (1879: 111; 1880: pl. 16, fig. 13a). As simple teeth have been described in all other species attributed to the genus, it seems likely that Bergh's material had a malformed radula.

A striking feature observed in each of the six species studied for this research concerns the formation of the uterine or insemination duct of the anterior genital mass. The uterine duct comprises always two parts; an outer large diameter part with a dilated inner end to which the spermatocyst is attached, and an inner very slender part

* A seventh species, bright orange with brown streaks on the notum, was taken at San Remo, Victoria, 27 February 1966. A description will be published at a later date.

connecting the dilation of the outer, here termed *large*, uterine duct to the ampula of the hermaphrodite duct. It is supposed that the large uterine duct and in particular its dilated end serve as a fertilizing chamber. Consequently, it is supposed that the inner, here termed *small*, uterine duct is the true uterine duct.

This division into large and small uterine duct is not indicated for the type species, *A. antillensis* Bergh (1879: 113), nor in *A. brunnea* Bergh (1907: 60, pl. 12, fig. 1) and *A. luctuosa* (Cheeseman, 1882; Odhner, 1934: 270, fig. 37). Bergh (1905: pl. 5, fig. 32) shows precisely the uterine division in *A. berghi* Odhner (1924: 53; = *A. luctuosa* Bergh, 1905) but from his text it is evident that the condition was misunderstood (1905: 77).

Odhner's contention that *Aphelodoris* species have a serial connection between the vagina, spermatheca, spermatocyst and uterine duct (1934: 270; 1926: 54, Halgerdinae) cannot now be justified. Among the present six species, only *A. lawsae* and *A. rossquicki* have a true serial connection. The three species, *A. juliae*, *A. greeni* and *A. berghi* have the vagina and uterine duct contiguous, thereby conforming to the semiserial connection. *A. varia* has neither the vagina and uterine duct diametrically opposite (serial) nor contiguous (semiserial). Instead, they are mid-way between these two forms of connection, and indicate the development of the two other forms.

The six species discussed here are loosely divided into two groups according to the live colour pattern. The first group has lines of black or brown around the notum and forming a reticulate pattern in the median area: *A. lawsae*, *A. rossquicki*, *A. varia*. The second group has no lines on the notum but has a variable pattern of brown and maroon blotches in the median area: *A. julia*, *A. greeni*, *A. berghi*. The shape of a mid half row tooth of the radula is probably the simplest characteristic to separate the species.

A New Zealand species, *A. affinis* Eliot (1907: 343) has been reported from Western Australia by O'Donoghue (1924: 556). Absence of actual material denies its verification or otherwise, but it is highly unlikely that the species is correctly identified.

Aphelodoris lawsae sp. nov.

Fig. 7-9, 30

Archidoris varia Basedow and Hedley, 1905: 150, pl. 5; non *Doris varia* Abraham, 1877: 209.

Archidoris varia. Cotton and Godfrey, 1933: 100, pl. 2, fig. 6-7, pl. 4, fig. 11-13.

Material examined. SOUTH AUSTRALIA: Reef, Christies Beach, near Adelaide, Gulf St. Vincent, 2 May 1963, 1 specimen (Holotype), Dr. Helene Laws, S.A.M. reg. no. D.14872; 2 unlocalized specimens (Paratypes), S.A.M. reg. no. D.14873; Sir Joseph Banks Group, Spencer Gulf, 13 June 1965, 1 specimen, R. Bentley, S.A.M. reg. no. D.14880.

Habitat. Under stones at low tide, dredged (? in shallow water), to 20 fathoms (Basedow and Hedley, 1905: 150).

Description. Living slugs grow to 44 mm in length, the preserved type series is 24-29 mm long and 12 mm wide. Living colouration is generally as depicted by Basedow and Hedley (fig. 30), that is pale brown with darker brown and fawn mottles around the notal margin, over which lies a fine tracery or reticulate pattern of brown lines, and the rhinophores and branchiae purple-brown. Preserved slugs vary from pale yellow with grey patches to reddish brown with brown patches. The specimen from Sir Joseph Banks Group (fig. 7) is chocolate brown with three large pale areas in the median line, numerous varying sized rays of brown around the margin, and the whole overlaid with a fine dark brown reticulation.

The body is rather elongate and high, the notal margin is distinct and narrow, the rhinophores have high collar-like sheaths and the branchial cavity has a similar sheath. The rhinophores have 24 lamellae, the branchiae number five tripinnate plumes.

The strap-like salivary glands are short and twisted. The labial cuticle is smooth. The radular formula is 25 x 70.0.70. The inner and outer teeth (fig. 8) are high with short cusps, those in the middle of the half row are longer with long curved cusps.

The anterior genital mass (fig. 9) is as usual in the genus. Ampulla (am) long and sinuous. Prostrate gland (pr) very large, flat and thin walled, vas deferens (vd) muscular, at first slender and coiled, then wider and straight, penial sheath (ps) long, cylindrical, muscular, somewhat wider near atrium. Vagina (va) short, large uterine duct (lut) long and coiled, a little wider at its end, small uterine duct (sut) slender and straight. Spermatheca (sp) large, ovoid, spermatocyst (sc) smaller, pyriform, arranged serially. Conical genital atrium strongly muscular.

Discussion. A. laursae is closely related to the new species, *A. rossquicki* from Victoria. Both have a reticulate pattern on the notum, in the former dark brown on chocolate brown, in the latter black on red-brown. *A. laursae* has more, less erect and less elegant teeth in the radula, and a much shorter vagina and smaller prostate gland in the genital organs to distinguish it from *A. rossquicki*.

This species has in the past been identified with *A. varia* (Abraham, 1877: 209) from New South Wales. However, the latter species is larger, paler with a large marbled pattern on the notum, and has slender more crowded radular teeth.

The species is dedicated to Dr. Helene Laws, Curator of Marine Invertebrates, South Australian Museum, who so kindly arranged the loan of material for this paper, and who also collected the holotype.

Aphelodoris rossquicki sp. nov.

Fig. 10-11, 31

Aphelodoris varia Odhner, 1934: 270, non Abraham, 1877: 209.

Material examined. VICTORIA: Ocean Beach, Flinders, 11 April 1965, 1 specimen (Holotype), T. Crawford, N.M.V. reg. no. F25,659; 9 May 1965, 5 specimens (Paratypes), R. Burn *et al.*, N.M.V. reg. no. F26,130; Cape Patterson, 29 November 1958, 1 specimen, Mrs. Hope Black, N.M.V. reg. no. F20,112.

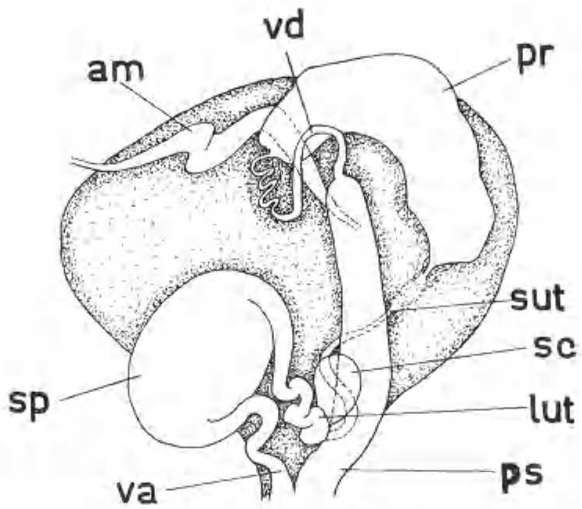
Habitat. Under stones near low tide level.

Description. The largest living slug was 35 mm long and 14 mm wide; the largest preserved one is 25 mm long and 14 mm wide. The colour pattern varies greatly; the Holotype (fig. 31) had a cream body, the notum was reddish-brown over a darker, nearly black, fine reticulation and with three irregular cream patches in the median line, and around the margin alternately red-brown and cream. The Paratypes differed regarding the amount of red-brown on the notum; some had a few small patches in the median area and one was entirely cream, in every case the black reticulation being present though even this is confined to the marginal area in some specimens. The foot is outlined in orange, the rhinophores and branchiae are purplish-brown. Preserved slugs retain much of their living colour.

The body is rather long, soft and smooth, the notum is fairly wide and marginally undulate. The rhinophores have 18 fine lamellae and high cylindrical sheaths. The five branchiae are tripinnate, the cavity has a low sheath. The oral tentacles are as usual grooved on the outer side.

The salivary glands have broad hook-shaped ends. The labium is smooth. The radular formula is 28 x 62.0.62. The inner teeth (fig. 10) have long cusps, those of the middle half row are high with a rather short cusp, the marginals shorter with slender cusps.

The anterior genital mass (fig. 11) has a wide twisted ampulla (am) the inner end of which is hidden behind the prostate gland. Prostate gland (pr) long and winding, vas deferens (vd) slender and muscular, penial sheath (ps) at first bent double, wider at the atrium.



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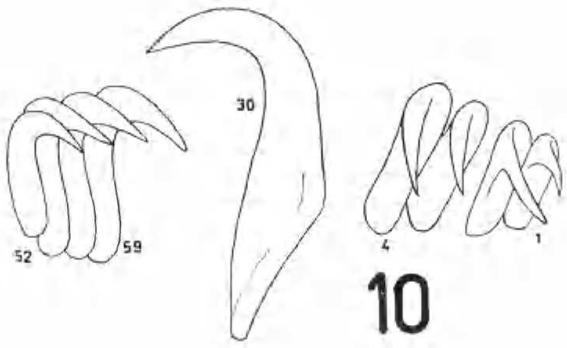

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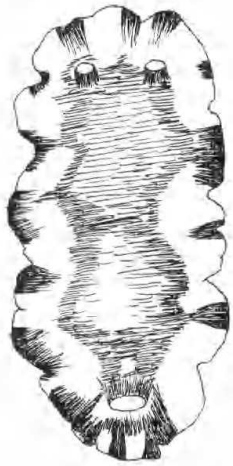

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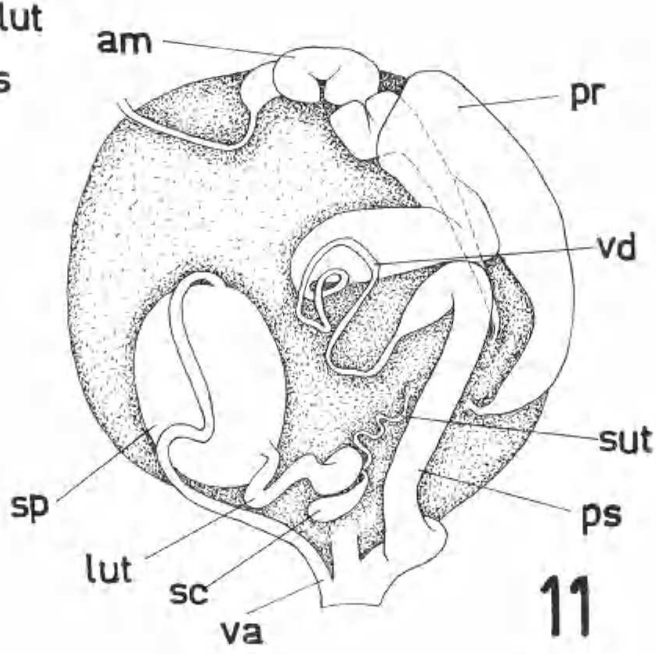

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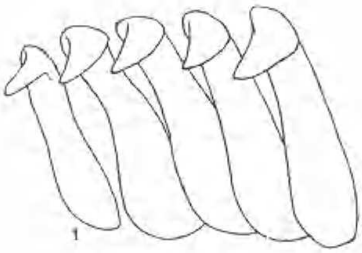

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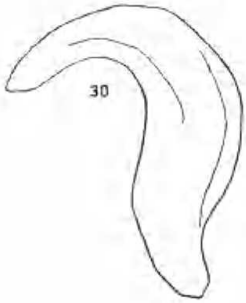
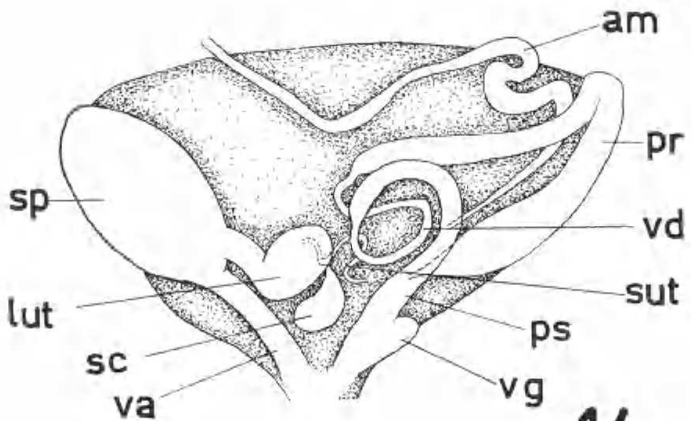




14

Figs. 9, 10, 11, 12, 13, 14.

Vas deferens and penial sheath of equal length. Vagina (va) slender and very long, entering top of large ovoid spermatheca (sp). Large uterine duct (lut) winding, dilated at inner end, small uterine duct (sut) very slender. Spermatocyst (sc) small, elongate pyriform; with spermatheca, arranged serially.

Discussion. Though similar in external appearance to *A. luwsae,* this new species differs in its prominent red-brown pigmentation over a black reticulation. Special anatomical characteristics are the elegant shape of the larger radular teeth, the exceptional length of the vagina, and the bent over first part of the penial sheath.

Odhner's *A. varia* from Victoria (1934: 270) is certainly this species. Serially connected seminal receptacles occur here and are considered diagnostic for this identification.

This species is dedicated to the memory of my late friend, Ross Quick, amateur conchologist and schoolmaster, and member of the party that collected the Paratypes.

Aphelodoris juliae sp. nov.

Fig. 12-14

Material examined. TASMANIA: Off Green Island, Simpsons Bay, Huon Channel, 21-25 July 1948, 2 specimens (Holotype and dissected Paratype), D. F. Turner, T.M. reg. no. E3587.

Habitat. Dredged in 5-7 fathoms.

Description. The larger slug is the dissected Paratype; it is 50 mm long, 28 mm wide and 15 mm high, and the sole is 12-13 mm wide for most of its length. The Holotype is strongly curled. Preserved colouration (fig. 12) consists of a creamy-orange body with large irregular sketchy patches and streaks of light maroon scattered over the notum. Around the notal margin the maroon forms alternating patches with the body colour. The foot and edges are orange, the rhinophores and branchiae black.

The body is large and rounded at each end, the notal margin is wide, very thin and undulate. The notum is entirely smooth. Rhinophoral and branchial cavities with high cylindrical sheaths.

EXPLANATION OF FIGURES *(continued)*

9. Anterior genital mass.

Fig. 10-11. *Aphelodoris rossquicki* sp. nov.

10. Half row of radula.
11. Anterior genital mass.

Fig. 12-14. *Aphelodoris juliae* sp. nov.

12. Dorsal view of flattened Holotype.
13. Half row of radula.
14. Anterior genital mass.

A pair of glands with long slender ducts and ramose ends are attached to the oral tube. The salivary glands are short and spatulate. The labium is very weak and quite smooth. The radular formula is 24 x 60.0.60; inner 12-15 teeth (fig. 13) small, slender and short cusped, those of middle large and strongly hooked, marginals short with long cusps.

Anterior genital mass (fig. 14): ampula (am) long, winding, partly hidden behind prostate gland; prostate gland (pr) very long, at first wider; vas deferens (vd) short, once coiled, muscular; penial sheath (ps) rather short and slender, at atrium with vestibular gland (vg). Vagina (va) short, spermatheca (sp) elongate oval, spermatocyst (sc) small, pyriform, arranged semiserially. Large uterine duct (lut) short, its end greatly dilated, small uterine duct (sut) very slender, winding.

Discussion. *A. juliae* is a distinctive species easily recognized by its large size and the sketchy maroon on the creamy-orange body colour. In the shape of the radular teeth, it is closest to *A. lawsae*, but the latter has an even shorter base and longer cusp. In the length of the prostate gland and penial sheath, it approaches near to *A. rossquicki*, but the greater vas deferens length in the latter, plus a far longer vagina indicate specific differences.

This species is dedicated to Mrs. Julia Greenhill, formerly Keeper in Invertebrate Zoology, Tasmanian Museum, Hobart, who so kindly forwarded a collection of opisthobranchs for study and later report.

Aphelodoris greeni sp. nov.

Fig. 15-17

Material examined. TASMANIA: Green's Beach, Kelso, Tamar River Estuary; January 1964, 1 specimen (Paratype), Q.V.M. reg. no. 1965.9.1; 29 September 1964, 1 specimen (Paratype), Q.V.M. reg. no. 1965.9.2; 11 September 1965, 1 specimen (Holotype), Q.V.M. reg. no. 1965.9.3; 30 October 1965, 10+ specimens, all collected by Mr. Robert Green and family.

Habitat. Under stones and crawling on weed in pools at low tide.

Description. The largest preserved slug is 32 mm long, the Holotype (fig. 15) is 27 mm long and 10 mm wide. The body colour is white or cream, the foot outlined with bright orange. The notal pattern consists of varying sized spots, blotches and patches of dark maroon, generally collected into three areas along the middle line. Pale brown epidermal pigment surrounds the dark maroon. The notal margin is lined alternately with dark maroon and orange. Some specimens have the maroon areas running into one another and extending nearly to the margin; others have orange pigment in place of the

pale brown. The rhinophores are blue-brown, the branchiae maroon. The maroon colour patterning persists in preservative but the orange gradually disappears.

The body is rather long, soft and smooth. The notal margin is fairly wide and undulate. The rhinophores and branchiae have prominent sheaths.

The salivary glands are long, strap-like and folded several times; in a fresh specimen they are bright pink in colour. The labium is smooth. The radular formula is 23 x 47-51.0.47-51. The inner 13 teeth have small cusps with a lateral curve, the others (fig. 16) are much larger, erect and the cusp is not greatly hooked.

Anterior genital mass (fig. 17) very small and compact. Female ducts not unlike those of *A. juliae*, but here spermatheca (sp) and spermatocyst (sc) smaller, large uterine duct (lut) longer, its dilated end much bigger. Male ducts have slenderer prostate gland (pr), much shorter penial sheath (ps) and larger vestibular gland (vg).

Discussion. *A. greeni* is closely related to *A. juliae* from southern Tasmania. It is distinguished externally by smaller size, narrower notal brim and intensity of colour patterning, and internally by the smaller radular formula, the erect shape of the larger teeth and details of the genital organs. The colour patterning of *A. rossquicki* is somewhat similar, but this new species lacks the black reticulation that is always present in the Victorian species.

This species is dedicated to my friend and able collector of Tasmanian opisthobranchs, Mr. Robert Green, Zoologist, Queen Victoria Museum, Launceston.

Aphelodoris berghi Odhner

Fig. 18-20, 32

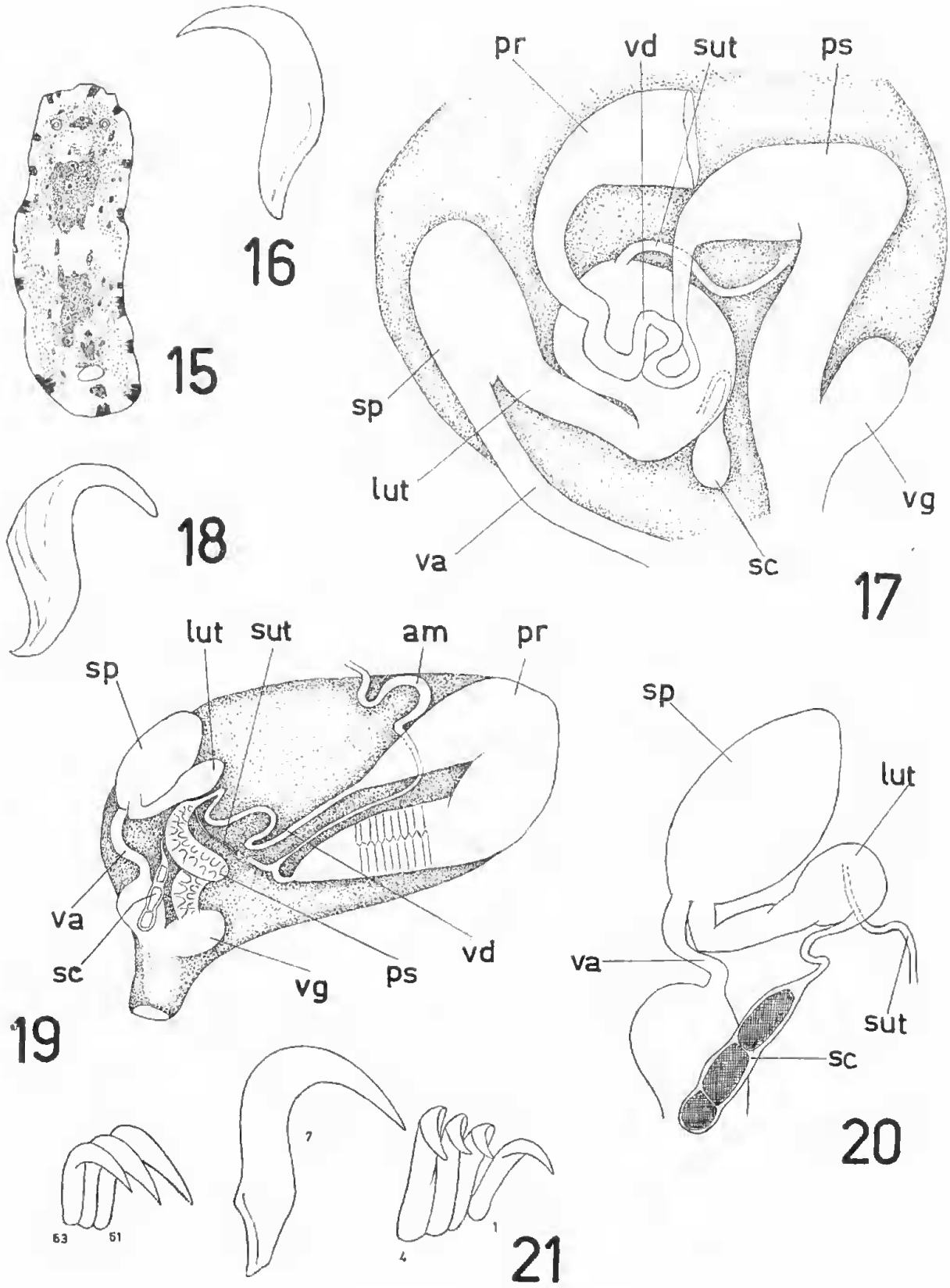
Aphelodoris berghi Odhner, 1924: 53; nom. nov. pro.

Aphelodoris luctuosa Bergh, 1905: 75, pl. 5, fig. 26-32, pl. 6, fig. 1-2, non *Doris luctuosa* Cheeseman, 1882.

Aphelodoris berghi. Burn, 1962A: 102, fig. 6-7.

Material examined. VICTORIA: Off Portsea pier, Port Phillip Bay, 15 April 1962, 1 specimen, Peter Goadby, and colour slides, J. Hope Black, N.M.V. reg. no. F22,358; Point Danger, Torquay, 30 March 1959, 1 specimen, R. Burn, N.M.V. reg. no. F23,026; 10 December 1965, 4 specimens, R. Burn, N.M.V. reg. no. F26,132; reef south of San Remo, 27 February 1966, 1 specimen, R. Burn, N.M.V. reg. no. F26,133.

Habitat. Crawling on weed and stones at and below low tide level, to 4 fathoms (Portsea).



Figs. 15, 16, 17, 18, 19, 20, 21.

Description. The animal, colour and radula of this species have previously been described from Victorian slugs (Burn, 1962A). A new figure of the animal is reproduced here (fig. 32). The labium is smooth, not armed as formerly stated (*loc. cit.*: 103). The radular formula of the Portsea slug is 20 x 50.0.50; the innermost teeth have short blade-like cusps, the others (fig. 18) agree precisely with the Tasmanian figures (Bergh, 1905: pl. 5, fig. 27-28, pl. 6, fig. 1).

Anterior genital mass (fig. 19-20) very compact. Ampulla (am) two loops, little differentiated from hermaphrodite duct. Prostate gland (pr) very large, yellowish, folded in two; its cells lie in two series that meet in middle line in regular pattern. Vas deferens (vd) long, slender. Penial sheath (ps) wider and strongly coiled, outer walls muscular, smooth, inner walls raised into distinctive oval pads. Vestibular gland (vg) forms large male atrium.

Vagina (va) bursa-like at atrium, then narrower to oval spermatheca (sp). Large uterine duct (lut) shorter than vagina, inner end dilated, spherical; small uterine duct (sut) very slender, rising from rear of dilation. Spermatocyst (sc) elongate, its duct long and slender; in the Portsea specimen, spermatocyst contained three whitish masses which upon removal easily broke apart. Common genital aperture conical.

Discussion. Despite the fact that the original Tasmanian specimen was black on the back and yellowish underneath (Bergh, 1905: 75), the present material is identified with *A. berghi* Odhner (1924: 53). Radular formula and shape of the teeth agree closely as do certain features of the anterior genital mass, such as the raised pads of the penial sheath, the spherical dilation of the large uterine duct and the wide spacing of the points of attachment of the small uterine duct and the duct of the spermatocyst.

A. berghi is by its colouration alone an easily distinguished species. It is also the smallest species of the genus recorded from the Australian coastline, growing to about 30 mm in length when crawling.

It would appear that the black colour of the type specimen is of little consequence. An entirely black specimen, both externally and

EXPLANATION OF FIGURES (*continued*).

Fig. 15-17. *Aphelodoris greeni* sp. nov.

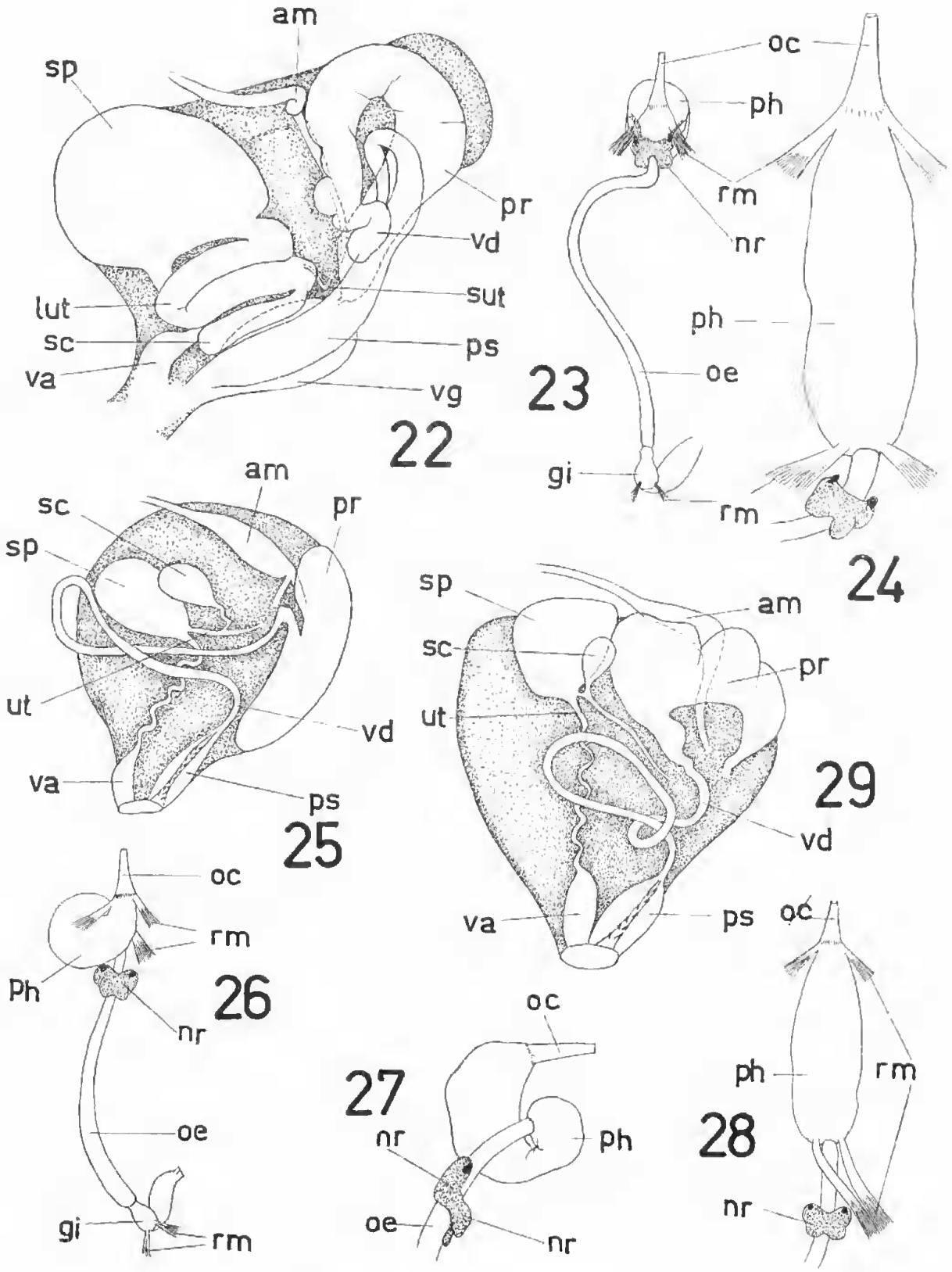
15. Dorsal view of Holotype.
16. Tooth from radular half row.
17. Female and part of male ducts, anterior genital mass.

Fig. 18-20. *Aphelodoris berghi* Odhner.

18. Tooth from radular half row.
19. Anterior genital mass.
20. Detail of female ducts.

Fig. 21-22. *Aphelodoris varia* (Abraham).

21. Half row of radula.



Figs. 22, 23, 24, 25, 26, 27, 28, 29.

internally, occurs among the specimens of *A. varia* (Abraham, 1877) examined for this research. Morphologically, the specimen is identical with others of normal cream and yellow colouration from the same general area of coastline.

Aphelodoris varia (Abraham)

Fig. 21-22, 33-34

Doris variabilis Angas, 1864: 44, pl. 4, fig. 1; non Kelaart, 1859.
Doris varia Abraham, 1877: 209.
Doris praetenera Abraham, 1877: 258, pl. 30, fig. 10-12.
Asteronotus varius. Iredale and McMichael, 1962: 93.

Material examined. NEW SOUTH WALES: Sydney Harbour, 1 specimen, J. P. Hill, A. M. reg. no. C1438 (black in colour); Pambula, 1957, 1 specimen, Mrs. T. W. Hartley, N.M.V. reg. no. F26,131; Bare Island, Botany Bay, 24 February 1961, 1 specimen and colour slide, A. Healy, A.M. reg. no. C.63086; Woody Head, Clarence River Heads, 1 May 1965, 1 specimen, Mrs. A. A. Cameron, A.M. reg. no. C.63087; 7 February 1966, 1 specimen, A. A. Cameron, A.M. reg. no. C.63088.

Habitat. Under stones and crawling on weed at low tide, to 2 fathoms on algae covered rocks (Bare Island).

Description. Crawling slugs measure at most 50 mm in length and 18 mm in breadth; a preserved slug of these live dimensions measures 34 mm long and 25 mm wide. Living slugs (fig. 33-34) have the notum yellowish white with alternates of white and brown around the margins. Immediately inside the margins lie as many as six somewhat irregular, discontinuous lines of light or dark brown. The median area is variously marbled with brown lines and small patches, rather sketchily in some specimens (fig. 33), prominently in others (fig. 34). The underside of the body is white, sometimes with small brown dots on the notal overhang. The rhinophores and branchiae are brownish-black.

The animals is rounded in front and behind. Rhinophoral and branchial cavities have high, cylindrical sheaths. The rhinophores have about 15 oblique lamellae. The branchiae consist of a single

EXPLANATION OF FIGURES (*continued*).

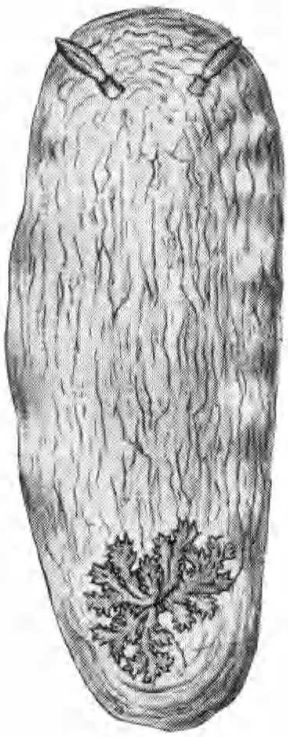
22. Anterior genital mass.

Fig. 23-25. *Doriopsilla carneola* (Angas).

23. Anterior alimentary tract.
24. Buccal mass, flattened, from above.
25. Anterior genital mass.

Fig. 26-29. *Doriopsilla aurea* (Quoy and Gaimard).

26. Anterior alimentary tract.
27. Buccal mass, from the right, retractor muscles not shown.
28. Buccal mass, flattened, from above.
29. Anterior genital mass.



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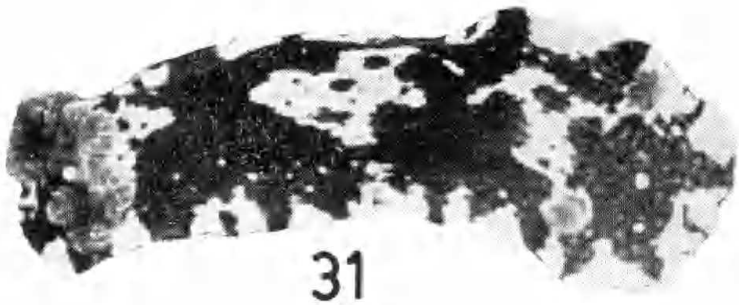

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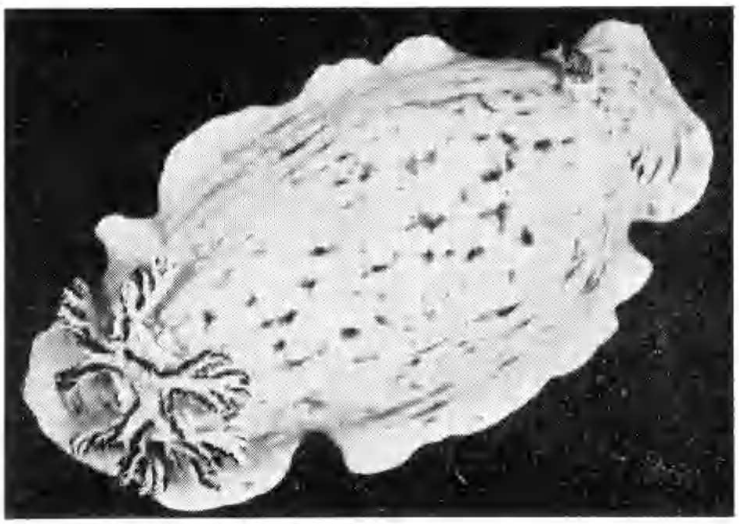

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34

Fig. 30-34.

30. *Aphelodoris lawsae* sp. nov., from Basedow and Hedley, 1905.
31. *Aphelodoris rossquicki* sp. nov., Holotype, photo. T. Crawford.
32. *Aphelodoris berghi* Odhner, Portsea Pier, photo. J. H. Black.
33. *Aphelodoris varia* (Abraham), Bare Island, photo. T. Healy.
34. *Aphelodoris varia* (Abraham), from Angas, 1864.

plume divided into a pair of laterally directed three-pronged bipinnate branchial ribs, each rimmed with short conical filiments and continuous even between each branchial rib and between each set of three ribs.

The salivary glands lie on top of the pharynx; they are flat, elongate and folded in two. The labium is usually smooth; in the Bare Island specimen, the surface was malleate and underside covered with elongate papillae. The radular formula varies from 21 x 56.0.56 to 25 x 63.0.63. The inner teeth (fig. 21) have short laterally curved cusps, those of the middle are strongly hooked and the marginals have a short base and long cusp. The teeth in each half row differ less in height from side to side and are more slender and erect than in other species of the genus.

Anterior genital mass (fig. 22); ampula (am) a brief winding of the hermaphrodite duct as it meets the genital mass; prostate gland (pr) large, bent double, at first narrower; vas deferens (vd) several short tight folds and narrow straight section; penial sheath (ps) long, wider towards atrium, vestibular gland (vg) large, sac-like. Vagina (va) short; spermatheca (sp) large, roughly circular; large uterine duct (lut) long, folded double, end little swollen; small uterine duct (sut) very short and slender; spermatocyst (sc) elongate, sausage-like.

Discussion. The encircling brown lines and the marbled patterning of the notal median area are decisive for the identification of *A. varia*. The shape of the radular teeth, the length of the large uterine duct and the sausage-like spermatocyst are also diagnostic.

A. varia is a common New South Wales species extending along the whole coastline.

Section Porostomata

Family Dendrodoridae

Dendrodoris nigra (Stimpson)

Doris nigra Stimpson, 1855: 380.

Dendrodoris nigra. Burn, 1962B: 166.

Material examined. SOUTH AUSTRALIA: American River, Kangaroo Island, 11 specimens, S.A.M. reg. no. D.14878.

Habitat. Under stones between and at low tide levels.

Distribution. Indo-Pacific, Queensland, New South Wales, Victoria, South Australia, Western Australia.

Discussion. The present preserved specimens are 30-40 mm in length, and uniform smoke-grey with paler notal margins. The species is already reported from Coobowie, St. Vincent Gulf (Burn, 1962B).

Doriopsilla carneola (Angas)

Fig. 23-25

Doris carneola Angas, 1864: 48; pl. 4, fig. 7.
Doriopsilla carneola. Burn, 1962B: 169.

Material examined. SOUTH AUSTRALIA: Sir Joseph Banks Group, Spencer Gulf, 13 June 1965, 3 specimens, R. Bentley, S.A.M. reg. no. D.14879.

Habitat. Dredged (? in shallow water) and under stones at low tide level.

Distribution. New South Wales, Victoria, Tasmania, South Australia.

Description. The largest preserved slug is 30 mm long, dull purple-red on the notum and paler on the sole. The notum is entirely granular in each specimen.

The pink pharynx (fig. 23-23, ph) is long and wide when stretched out but is thrice folded in life. Paired retractor muscles (rm) are attached to the posterior of the conical white oral cavity (oc) and the pharynx (ph). The nerve ring (nr) lies immediately behind the pharynx. The white oesophagus (oe) is long, slender and curved to the left. At its end lies a muscular cream coloured gizzard (gi) with a pair of small retractor muscles (rm).

Anterior genital mass (fig. 25); ampulla (am) small, branching to male and female ducts. Prostate gland (pr) large, flat; vas deferens (vd) slender, long, looped; penial sheath (ps) short, muscular, inner walls with several spiral series of minute hooks. Vagina (va) long, very slender, winding; spermatheca (sp) large, pyriform; spermatocyst (sc) smaller; uterine duct (ut) short, straight.

Discussion. The constant red colouration of the granular notum, the position of the nerve ring immediately behind the pharynx and the large size of the prostate gland distinguish *D. carneola* from the species listed by Marcus (1961: 144-146).

Doriopsilla aurea (Quoy and Gaimard)

Fig. 26-29

Doris aurea Quoy and Gaimard, 1832: 265, pl. 19, fig. 4-7.
Doriopsilla aurea. Burn, 1962B: 168.

Material examined. SOUTH AUSTRALIA: Sir Joseph Banks Group, Spencer Gulf, 13 June 1965, 1 specimen, R. Bentley, S.A.M. reg. no. 14883; Neapean Bay, 7-14 May 1938, 1 specimen, F. Moorhouse, S.A.M. reg. no. D.14882.

Habitat. Dredged (? in shallow water); under stones at low tide level.

Distribution. New South Wales, Victoria, Tasmania, South Australia.

Description. The larger preserved specimen measures 32 mm long and 19 mm wide. The colour of both is pinkish yellow, the retracted rhinophores orange. The notum is fairly soft and pustulose, particularly near the margins.

The orange pharynx (fig. 26-28, ph) is short and fairly broad when rolled flat. In life it is curiously rolled or looped to the left side and held in place by the diverging pair of retractor muscles (rm) attached to the conical white oral cavity (oc) and the dextrally directed parallel pair of posterior pharynx retractors (rm). The nerve ring (nr) lies some distance behind the pharynx. The cream oesophagus (oe) is long and curved to the left; the muscular gizzard (gi) is pale yellow.

Anterior genital mass (fig. 29); ampulla (am) small; prostrate gland (pr) large, flat, lobate; vas deferens (vd) slender, long, looped; penial sheath (ps) short, stout, inner walls armed with hooks. Vagina (va) very slender, long, winding; spermatheca (sp) large, ovoid; spermatocyst (sc) small, pyriform, very close to spermatheca; uterine duct (ut) rather long.

Discussion. In life, the orange colouration of *D. aurea* is its chief characteristic. Of the anatomy, the rolled-up pharynx, the lobate prostate gland and the proximity of the seminal vesicles are features to separate the species from its congeners.

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SOMMAIRE

Dans une collection de dix espèces d'opisthobranches (Mollusca: Gastropoda) de l'Australie du Sud, on en décrit trois comme nouvelles: *Haminoea maugeansis* (Atyidae), *Neodoris subaustralis* et *Aphelodoris lawsae* (Dorididae), et l'une des autres est un nouvel enregistrement pour cet Etat: *Chromodoris tasmaniensis* Bergh, 1905 (Dorididae). Des études du genre *Aphelodoris* Bergh, 1879, dans le sud-est de l'Australie indiquent six espèces distinctes, dont deux portent déjà les noms *berghi* Odhner, 1924, et *varia* (Abraham, 1877), tandis qu'on en décrit quatre comme nouvelles: *lawsae*, *rossquicki*, *juliae* et *greeni*. Selon la litterature, *Aphelodoris* en Australie se distingue des autres espèces du genre en ce que l'oviducte entre les glandes du mucus et de l'albumine et la spermatothèque se divise dans un vrai *petit* conduit utérin et un *grand* conduit utérin qui se dilate terminalement. Le spermatocyste s'attache à cette dilation terminale du grand conduit utérin.

ABBREVIATIONS

am—ampula; gi—gizzard; lut—large uterine duct; nr—nerve ring; oc—oral cavity; oe—oesophagus; ov—oviduct; pe—penis; ph—pharynx; pr—prostate gland; ps—penial sheath; rm—retractor muscles; sc—spermatocyst; sp—spermatheca; sut—small uterine duct; ut—uterine duct; va—vagina; vd—vas deferens; vg—vestibular gland.